IMPACT OF INSTRUCTIONAL MATERIALS IN TEACHING AND LEARNING OF PHYSICS IN SENIOR SECONDARY SCHOOLS: A CASE STUDY OF SOME SELECTED SECONDARY SCHOOLS IN ONITSHA EDUCATIONAL ZONE

by

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Abstract

The study is geared towards assessing the impact of instructional materials in teaching and learning of physics in senior secondary schools with special reference to secondary schools in Onitsha Educational zone of Anambra State. The study utilizes the simple random sampling technique. Physics Achievement Test (PAT) and questionnaire are the instrument used for data collection. The (PAT) at 0.82 reliability was used to measure the achievement of the students in physics and the questionnaire was used to ascertain how the use of instructional materials improved the performance of the physics teachers. The students were divided into two groups (experimental and control) groups. The experimental group was taught using instructional materials while the control group was taught without instructional materials. Data collected analyzed using mean, simple percentage, and z- test statistics. The findings revealed that students taught with instructional materials performed better than those taught without instructional materials. The findings also showed that the use of instructional materials in teaching influences the performance of the physics teacher positively. The null hypothesis tested at 0.05 level of significance indicated that there is significant difference between the physics achievement scores of those taught with instructional materials and those taught without instructional materials. Based on the above findings, the researcher recommend that teachers, students, parents and educational administrator and policy makers should make concerted efforts to make sure that instructional materials is to be use in teaching and learning of physics in our secondary schools.

Introduction

Background of the study

Science has been regarded as the bedrock or modern day's technology. Countries all over the world, especially the developing ones like Nigeria are striving hard to develop technologically and scientifically, since the world is turning scientific and all proper function of lives depend greatly on science. According to Ogunlege (2002), science is a dynamic human activity concerned with understanding the workings principles of our world. This understanding helps man to know more about the universe. Without the applications of science, it would have been difficult for man to explore the other planets of universe. Science comprises the basic disciplines such as physics, chemistry, mathematics and Biology. Many investigations have shown that secondary school students are exhibiting dwindling interest in science (Esiobu, 2005)

Physics is the bedrock of science and technology because many of the tools on which the scientific and technological development depend, are the direct products of physics. Physics is therefore a core subject in science and technology since it studies the essence of natural phenomena and helps people understand the rapidly technological changing society (Zhaoyganas, 2002). Physics as one of the core subject in science remains one of the most difficult subjects in school curriculum according to the Nigeria Educational Research and Development Council (NERDC) (Isola, 2010). Studies have revealed that the performance of Nigeria students in ordinary level physics was generally and consistently poor over the year (Akanbi, 1983: Omosewo, 1999).

Instructional material is an aid to teaching and learning. It helps to raise learning from verbalization to practical aspect of teaching and learning. Instructional materials make teaching and learning interesting, easy and amusing. It makes learning more effective (Clerk, 1997). An instructional material makes students understand physics more easily when the teacher makes use of working model. It makes the teacher task easier and more effective. Olardi,(1990) highlighted the impact of instructional materials that teachers use to improve the students understanding and perception of the subject. It brings clarity and creates recognition that allows them to have a realistic hand and total knowledge of the student. It enhanced learning, improve the competence of the learners and makes learning more meaningful to the students.

In Onitsha Educational Zone of Anambra state, teaching and learning of physics through the use of instructional materials facilitates, stimulates and aids student to take active interest in the topic introduced by the teacher. An instructional material has emotional impact on physics student and affects their attitude towards what is presented as the topic to study by the teacher. It provides both physics students and physics teachers with relevance and meaningful source of information.

Kay (2008), Instructional materials stimulate the students desire to learn, it assist learning process by making assimilation and memorization of materials easy. Also it helps to hold attention of the student. Finally instructional materials makes learning available to a wider audience, control the pace of learning, promote better understanding of physics concepts and helps to overcome difficulties in presenting physics lesson.

Statement of the Problem

The use of instructional materials in teaching and learning of physics make it easier and brings about desirable change in the teaching learning process. There is lack of instructional materials in our schools today resulting from low sighted government involvement in education, poor management of funds by key players and lack pre-requisite knowledge of the subject by physics teachers for proper usage. As a result students find it difficult to learn physics as such develop low interest for it. This is because physics teachers adopt the verbalistic and theoretical method as a way of teaching and learning of physics, mainly due to non- availability of instructional materials in schools. Therefore the study is designed to survey the impact of instructional materials in teaching and learning of physics in secondary schools. A case study of some selected secondary school, in Onitsha Educational zone of Anambra state.

Purpose of the Study

The objective of this project is to critically appraise and analyze the impact of instructional materials in teaching and learning of physics in secondary schools in Nigeria with particular reference to Onitsha Educational Zone as a case study. The study tends to find out the following:

1. The mean achievement scores of physics students taught with instructional materials and those taught without instructional materials.
2. Determine if such effect depends on gender (sex) of students.
3. Find out how the use of instructional materials in teaching influences the performance of the physics teacher in the classroom.

Research Questions

In the field of physics, it has been observed that the use of instructional materials play a major role to the teaching and learning of physics. Based on the above observation, the researcher generated the following questions to guide the study:

1. What is the mean achievement scores of physics students taught with instructional materials and those taught without instructional materials?
2. What are the mean achievement scores of male and female students taught with instructional materials?
3. How does the use of instructional materials in teaching and learning of physics influence the physics teachers' performance in the classroom.

Hypothesis

The null hypothesis was tested at 0.05 level of significance

H_0: There is no significance difference between the mean achievement scores of physics students taught with instructional materials and those taught without instructional materials.

Ha1: There is a significant difference between the mean achievement scores of physics student taught with instructional materials and those taught without instructional materials.

Research Design

Enemuo (2009) posits that research design is the plan or organization of a scientific investigation" she further adds that "designing a research comprises of the development of a plan or strategy that will guide the collection and analysis of data". It is a format that serves as a valuable tool to the investigators in the effort to generate data for a study.

This study is designed in order to gain insight into the impact of instructional materials in teaching and learning of physics in Onitsha Educational zone of Anambra State. The researcher chooses to base the study on quasi experimental design and samples collected from five secondary schools selected randomly from the study area.

Area of the Study

The research work covers some selected secondary school classes in Onitsha Educational zone of Anambra State.

Population of the Study

Fraentel (1996) defines population as the group to which the results of the study is intended to apply. That is to say, that population is defined in such a way that the result of the investigation is generalized unto it. This definition implies that population should be such that can provide the most authentic and dependable data necessary for solving the problems.

This study is limited to teachers and students of physics in secondary schools. The investigators through random sampling selected five schools in Onitsha Education zone of Anambra state. Hundred (100) copies of test were administered to the physics student and fifteen (15) questionnaires were administered to physics teachers.

Sample and Sampling Techniques

Nworgu (2006) says that "a sample is a smaller group of elements drawn through a definite procedure from a specified population for inclusion in a study and from which the researcher hope to gain generalizable knowledge about the whole population". The sample technique used in this research work is the simple random sampling. Simple random sampling according to Nworgu (2006) is the type of sampling in which each element in the population has equal and independent chance of being included in the sample"

The investigator used five secondary schools from Onitsha Educational zone of Anambra State as the representative zone, since a standard and centralized curriculum is used in all schools thus what is taught in one school is the same everywhere. Twenty five senior secondary three (SS3) physics students randomly selected and all the physics teachers from each of the five selected schools were used for the study.

Procedure of Data Collection

The principal instruments for data collection used in this work are:

- Physics Achievement Test (PAT)
- Questionnaire

The researcher visited the sampled schools through the co-operation of the physics teachers administered the test to the physics. The physics achievement test contains fifteen (15) items and four multiplier choice option objective questions. The students were made to select the correct answer from the four options. The researcher with the help of the physics teachers ensure strict supervision so as to get authentic and reliable data. The physics achievement test was used to measure the achievement of the physics students in the test. Out of the fifteen (15) items on the test nine (9) were drawn from wave and (7) from linear momentum

The researcher also administered questionnaire to the physics teachers in the five selected schools to find out the effect of instructional materials on the performance of the physics teacher in the classroom. The questions consist of five (5) items which was designed using four (4) likert scales, strongly agree, agree, disagree and strongly disagree.

Validation of Instrument

Fraenkel (1996) Postulates that "validity refers to the appropriateness, meaningfulness and usefulness of the inference a researcher makes". This suggests that validation is the process of

collecting evidence to support such inferences. The validity of the instrument was ascertained by presenting the instrument for data collection to an authority in measurement and evaluation and a physics teacher in one of the selected school for some observations and modifications before distribution.

Reliability of Instrument

Wiersma (1986) says that "reliability of research concerns the reliability and consistency or the methods, conditions and results. This means that for an instrument to be seen as reliable there must be elements of consistency imbedded in the possible outcome or results. So the instrument for data collection is reliable because it has been verified and tested by Akujieze (2015).

Method of Data collection

The Achievement test and questionnaires were administered by the researcher at the different school.The test were administered to a total number of twenty physics students from each school that was selected through simple random sampling. Based on pre test administered to the students, two equivalent groups, group A and group B comprising of ten (10) physics students were used for the study. The student under experimental group were taught with instructional materials while the students under control group were taught without instructional materials .The experimental and control groups were taught (concept of motion) for a period of four weeks. At the end of the teaching period, physics Achievement test containing twenty question items based on the content taught were administered to the students under thorough supervision. The test materials were retrieved from students after thirty minutes. A questionnaire comprising of twenty items constructed based on the possible effects of instructional materials on teaching and learning of physics were administered to physics teachers from each selected school and on the spot collection method was adopted by the researcher.

Method of Data Analysis

The statistical method use in analyzing the data collected from the test and questionnaire is the mean, frequency table and simple percentage. The formula for calculating the mean is

$X = \sum fx/\sum f$

Where X–= Mean
$\sum$ = Summation
F = Frequency,
x = Scores

To find the percentage of positive responses in each item, this formula is applied.

Percentage %Type equation here. $= \frac{F}{N} \times 100$

Where % = Positive response percentage
F = frequency
N = Total number of response

The hypothesis will tested using 2- test at Alpha (∞) level of 0.05 or 5% level of significance

$$Z = \frac{\overline{X}_A - \overline{X}_B}{\sqrt{\frac{S_A^2 - S_B^2}{N_A \quad N_B}}}$$

Result

Research Question 1: What is the mean achievement scores of physics students taught with instructional materials and those taught without instructional materials.

Mean and standard deviations of physics taught with Instructional materials and those taught without instructional materialsv.

Group	Number	Mean x	Standard Deviation
Experimental (A)	50	12.04	2.00
Control (B)	50	7.56	3.46

Table 1 revealed that mean score of physics students taught without instructional materials (experiential group) and those taught without instructional materials (the control group) respectively are 12.04 and 7.56. This shows that physics students taught with instructional materials perform better than those taught without instructional materials.

Research Question 2: What is the mean achievement scores of male and female students taught with instructional materials?

Table 2: Mean and Standard Deviation of Male and Female Students

Gender	Number	Mean X	Standard Deviation
Male	25	12.08	2.10
Female	25	12.00	1.90

Table 2 shows the mean score of male and female students taught with instructional materials respectively are 12.08 and 12.00. This indicates that, there is no much difference between the mean performance of male and female students taught with instructional material.

Analysis of Teachers' Response

Research Question 3: How does the use of instructional materials in teaching and learning of physics influence the performance of the physics in the class room?

Table 3: Result showing how the use of Instructional Material Influence Physics Teacher Performance in the Classroom

Level of Responses	Frequency	Percentage %
Strongly Agree	7	46.67
Agree	5	33.33
Disagree	1	6.67
Strongly Disagree	2	13.33
Total	15	100

Table 3 investigation shows how the use of instructional materials in teaching and learning of physics influences the physics teachers performance in the classroom. Out of the 15 physics

teachers used for the study, 46.67% (7) of them strongly agreed that instructional materials influence classroom performance of physics teachers, 33.33% (5) of the physics teachers agreed to the research question 6.67%(1) of the physics teachers respondent disagreed to the question, while 13.33% (2) strongly disagreed to the above questions.

Table 4

Z Test Table For Mean Score of Student Taught With Instructional Materials and Those Taught Without Instructional Materials

Group	N	x	SD	df	Z-cal	Z-crit	Decision
Experimental (A)	50	12.04	2.00	100	7.93	1.98	Reject
Control (B)	50	7.56	3.46				H_0

Table 4 showed that the calculated Z-value was 7.93 of the critical value was 1.98. Since the calculated Z-value is great than the critical value of Z. The researcher hereby rejects the null hypothesis and accepts the alternative. Thus there is a significance difference between the mean achievement scores of physics students taught with instructional material and those taught without instructional materials.

Discussion of the Result

From the response to the questionnaires administered to the teachers and the achievement test administered to the students, the researcher was able to find out the impact or importance of the use of instructional materials in teaching and learning of physics in senior secondary schools in Onitsha educational zone of Anambra state

Results from Table 1 show that physics students taught with instructional materials performed better than those taught without instructional materials.

Table 2 seeks to find out the extent to which gender affects the mean achievement scores of physics students taught with instructional material. The findings revealed that the mean achievement scores of male and female students were almost the same.

Table 3, exposed how important the use of instructional materials is to the physics teacher in the classroom. The use of instructional material in teaching and learning of physics influences the performance of the physics teacher in the classroom positively.

From Table 4, the test of null hypothesis show that there was a significant difference between the mean achievement scores of physics student taught with instructional materials and those taught without instructional materials.

Conclusion

The findings provided the researcher with a broader concept of the impact of instructional materials in teaching and learning of physics in senior Secondary schools. The use of instructional material in teaching and learning of physics influences the cognitive affective and psychomotor achievement of physics students. It helps the physics students in recalling and recognition of information and principles of physics develop intellectual ability of the physics. It helps to make teaching and learning of physics fun by providing the students of physics a firsthand experience. The use of instructional materials in teaching and learning of physics influences the classroom performance of the physics. It makes the teacher to teach without stress.

Recommendations

Based on the findings, the following recommendations were made;

1. Teachers, student and educational administrators and policy makers should attach greater importance to the use of instructional materials in teaching and learning of physics in our senior secondary schools, knowing and appreciating fully well, the enormous benefits that come with it.
2. Government, Ministries of education, educational agencies should provide instructional materials in secondary schools to enhance effective teaching and learning.
3. Enough time should be allotted for physics class in the school time table for effective use of instructional materials in teaching physics.
4. Seminars, workshop on the use of instructional should be organized for physics teachers in order to help update their knowledge and improve on their teaching effectiveness.
5. Teachers and students should be encouraged to form the habit of improvising instructional materials to make up the shortfall in supply.

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